

# Results of the 1<sup>st</sup> ONR-AUVSI Autonomous Underwater Vehicle Competition

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## LONG-TERM GOAL

The long-term goal of this effort is to create an annual event that will challenge students to advance the technologies associated with autonomous underwater vehicles (AUVs) and related systems as well as draw attention to developments in AUV technologies.

## OBJECTIVES

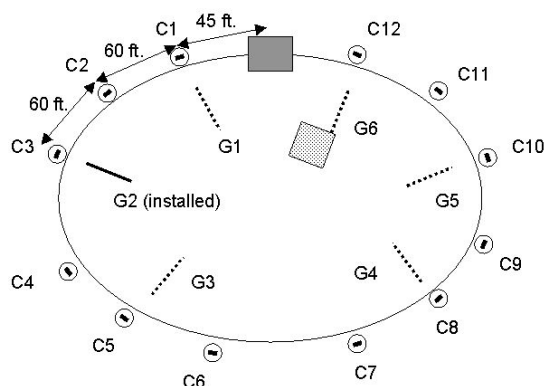
We created a multi-faceted competition scenario that would be achievable but very unlikely to be completed in its entirety. The intent was to sufficiently challenge not only smaller or less advanced academic programs but larger, more-advanced institutions as well. The specific objectives were to demonstrate systems and technologies related to autonomous navigation, some level of intelligence and self-correction, and the ability to conduct a survey of a given zone and determine a maximum depth.

## APPROACH

The 1<sup>st</sup> Annual Autonomous Underwater Vehicle Competition was created and held on August 1-3, 1998 at the Coastal Systems Station in Panama City, Florida. A strong field of four teams completed the requirements for entering the Competition and participated onsite. A freshwater test pond at the CSS was converted into the Competition site. A platform on the side of the pond was the launch point from which the entries would be lowered into the water. Once in the water, the vehicles were to navigate a series of six submerged "gates" throughout the pond and eventually end up in a target zone within which existed a predetermined deepest point. The vehicles were to conduct a search of the

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target zone and deploy a furnished depth marker over the deepest point. Upon deployment of the marker, the vehicle would surface as the completion of its mission.



## WORK COMPLETED

The format for the competition was determined and a list of appropriate outlets was used to announce the event and invite participants. In addition, calls were made to key individuals in select universities active in oceanography, marine sciences and robotic systems.

AUVSI staff, in conjunction with CSS personnel, developed a work plan and all necessary elements of the event were prepared and secured. In addition to the Competition logistics, it was agreed that some mechanism must be devised to verify the successful navigation of each gate. Under this grant, seven underwater cameras were fabricated and attached to each of the gates and the recovery zone. The cameras were each connected with a central receiving and display unit.

As part of the Competition, the entrants were required to submit journal papers explaining their approach and vehicle design. Additionally, the day before the Competition was held, the teams were subjected to static judging by a panel of judges. This provided the opportunity for explanations and questions to be asked of the teams.

The final step of the event was the actual performance runs attempted by the four teams.

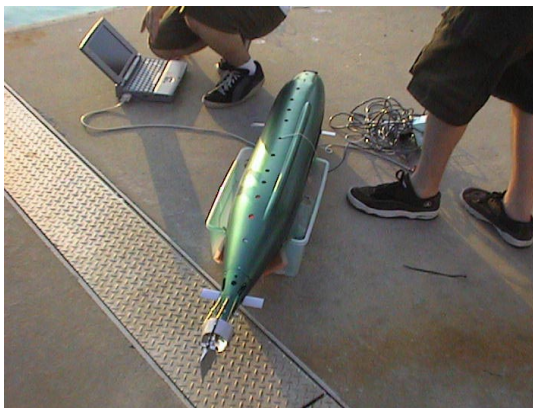
## RESULTS

Of the four teams that entered the inaugural event, two teams were able to launch their vehicles into the pond. The other two teams encountered major technical and integration problems and were unable to proceed to launch.

Of the two teams that launched, both achieved the first requirement for autonomous forward movement. For one of the two teams, that achievement was their only one. The other team -- the eventual winner of the Competition -- succeeded in navigating through two gates before going astray. Obviously, no team was able to complete the gates and make it to the recovery/depth-marker zone.



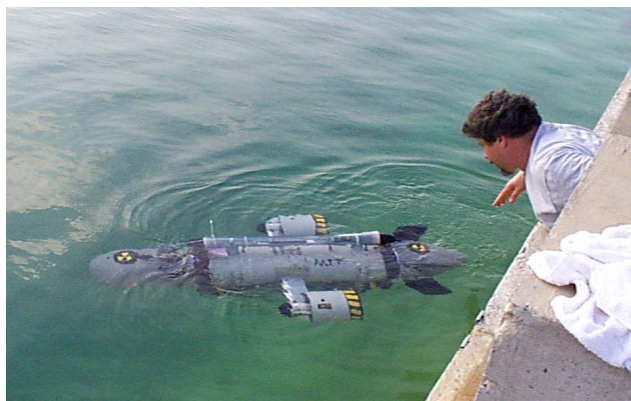
The distinguished panel of judges confers.



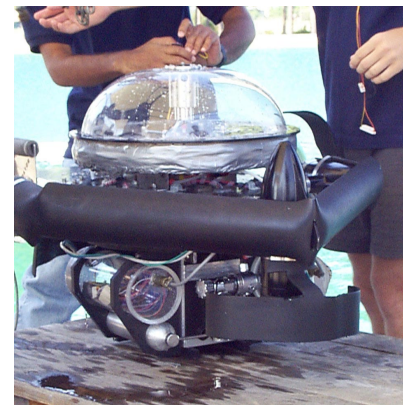
Stevens Institute of Technology used "off-the-shelf" hardware.



The team from Johns Hopkins making onsite modifications.



MIT's ORCA departs on its winning run.



University of Florida's entrant, "SubjuGator"

## **IMPACT/APPLICATION**

The first International AUV competition has generated interest in AUV technology in a wide range of undergraduate institutions, many of them not known for their programs in ocean systems. In addition to the four teams that entered (MIT, Stevens, Johns Hopkins, and Florida) we have already received interest from the USNA, Naval Postgraduate School, U. of Miami, and Florida Atlantic University for the 1999 competition. This competition, and others derived from it, will increase the awareness of the technical challenges faced by the U.S. among students and educators throughout America. The students competing in the competition are tackling the fundamental problems in the design of ocean systems. Upon graduation, they will be primed for jobs with the Navy and navy contractors developing state-of-the-art systems.

## **TRANSITIONS**

Two devices used as part of the Competition are being utilized in other ONR efforts: The depth-marker which was fabricated for use by the AUVs and the custom underwater cameras that were mounted on each gate to verify successful navigation by the vehicle.

## **RELATED PROJECTS**

None

## **REFERENCES**

None

## **PUBLICATIONS**

None